

Sample  
GenSci 102: Test # 4  
Final Exam  
Earth As A System

Total points = 238

GENSci 102: ENVIROINMENT: EARTH  
**THE EARTH AS A SYSTEM**

L. S. Fichter - James Madison University

**INSTRUCTIONS:**

- (A) **Write your social security number on the Scantron card.** Your test score will be sent to you via e-mail. If you do not have e-mail, you can see me for your score
- (B) Note that your test **score** is not your test **grade**. Check with the posted curve to convert your test score into a grade.
- (C) **Timing:** you have exactly the class time to take the test, no more.

The questions are a mixture of True/False and Multiple Choice questions. The different kinds of questions are mixed through the test.

- ☞ Multiple choice questions may have 3, 4, 5, or as many as 20 choices. When there are more than 5 choices they are distributed among more than one question number; e.g. question 24 has choices 1-5, question 25 choices 6-10, etc.
- ☞ Different questions may have different values, as indicated with each set of questions.
- ☞ Drawing, diagrams, figure required for certain questions are often at the back of the test. You may pull that sheet off to make it easier to answer questions.

- ☞ Observe that on some of the questions the scoring will be "rights minus wrongs." Such questions are labeled. That is, you get points for a right answer, zero for no answer, and a negative score for wrong answers. Don't guess!

- ☞ Wrong spellings are not part of the test. I do not deliberately make minor errors, or try to be confusing or ambiguous. If something seems strange assume it is an honest mistake and answer the question as best you can.

- ☞ However, questions may be subtle and complex, read them carefully.

**Note that your grade for the test will be based on a curve drawn over the distribution of raw scores. I draw the curve by hand, but have no need to have a specific percentage of A's, B's, C's etc. In fact, I would like everyone to do well, but will draw the most fair curve I can based on how everyone in the class does. I ignore the computer generated percentages.**

**Your raw score will be sent to you via e-mail. The raw score is not your grade, but I will send the curve ranges to you also so you have an idea how you did. Check the bulletin board opposite my office (Miller 233) for the final curve.**

## STRESS AND STRAIN

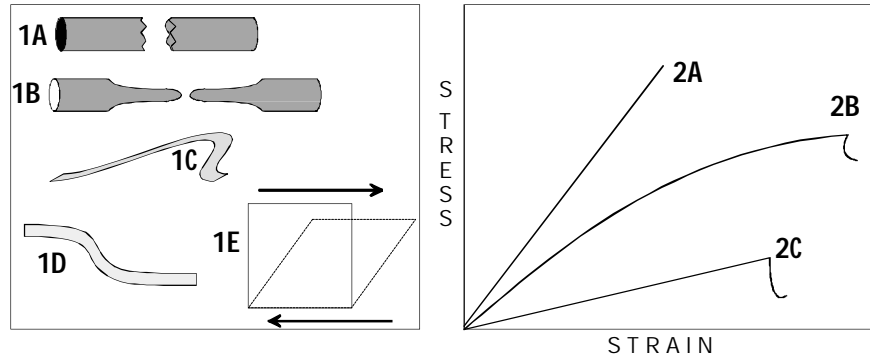
**RIGHTS MINUS WRONGS:**

**MULTIPLE CHOICE**

**QUESTIONS: 3 points**

**each, 33 points total:** To

the right are diagrams illustrating various stress-strain conditions. For each question identify the correct illustration.



**Ductile Deformation.** Mark any and all letters which show this behavior.

1. 1A, 1B, 1C, 1D, 1E
2. 2A, 2B, 2C

**Shear Deformation.** Mark any and all letters which show this behavior.

3. 1A, 1B, 1C, 1D, 1E
4. 2A, 2B, 2C

**Non-linear Deformation.** Mark any letters which show this behavior.

5. 1A, 1B, 1C, 1D, 1E
6. 2A, 2B, 2C

**Confining Pressure.** Mark any and all letters which show behavior that would/could occur under confining pressure.

7. 1A, 1B, 1C, 1D, 1E
8. 2A, 2B, 2C

**TRUE/FALSE QUESTIONS: 2 points each, 8 points total:** "A" is True. "B" is False.

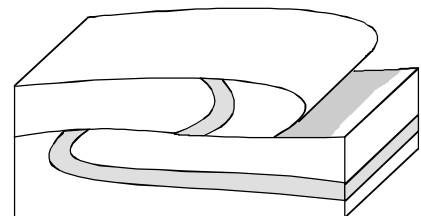
9. T/F. In the short term a balloon does not show an elastic limit, but over long periods of time elastic limit behavior does appear.

10. T/F. Hot rocks are more likely to undergo rupture than cold rocks.

11. T/F. The foliation in metamorphic rocks is the result of hydrostatic stress.

12. The drawing to the right is best explained by which of the stress/strain lines above.

A=2A, B=2B, C=2C



## STRUCTURAL GEOLOGY

### RIGHTS MINUS WRONGS MULTIPLE CHOICE QUESTIONS: 3 points each, 48 points total:

At the back are 12 block diagrams illustrating structural features. From the 12 identify any and all diagrams which contain the structural feature asked for below. Note that some questions may end up with no answer. Some blocks may be used more than once, if, for example, they satisfy a vertical fault and also a right lateral fault (which together would, of course, make it oblique.)

**Normal Faults (NOT oblique):** mark one or more of the 12 choices containing this feature.

- 13. Set One: 1A, 1B, 1C, 1D
- 14. Set Two: 2A, 2B, 2C, 2D
- 15. Set Three: 3A, 3B, 3C, 3D

**Reverse Faults (including oblique):** mark one or more of the 12 choices containing this feature.

- 16. Set One: 1A, 1B, 1C, 1D
- 17. Set Two: 2A, 2B, 2C, 2D
- 18. Set Three: 3A, 3B, 3C, 3D

**Vertical Faults (including oblique):** mark one or more of the 12 choices containing this feature.

- 19. Set One: 1A, 1B, 1C, 1D
- 20. Set Two: 2A, 2B, 2C, 2D
- 21. Set Three: 3A, 3B, 3C, 3D

**Right Lateral Motion (including oblique):** mark one or more of the 12 choices containing this feature.

- 22. Set One: 1A, 1B, 1C, 1D
- 23. Set Two: 2A, 2B, 2C, 2D
- 24. Set Three: 3A, 3B, 3C, 3D

**Shear Stress:** mark one or more of the 12 choices exhibiting this behavior.

- 25. Set One: 1A, 1B, 1C, 1D
- 26. Set Two: 2A, 2B, 2C, 2D
- 27. Set Three: 3A, 3B, 3C, 3D

**Horst:** mark one or more of the 12 choices exhibiting this feature.

- 28. Set One: 1A, 1B, 1C, 1D
- 29. Set Two: 2A, 2B, 2C, 2D
- 30. Set Three: 3A, 3B, 3C, 3D

## INTERPRETING GEOLOGIC HISTORY

### RIGHTS MINUS WRONGS: MULTIPLE CHOICE QUESTIONS: 3 points each; 9 points

**total:** At the back of the test is a block diagram of a portion of the earth's crust. The questions below concern unraveling the history in that block diagram.

31. **Unconformity from rock units B to A?** This unconformity is?  
*A=None, B=Nonconformity, C=Angular unconformity, D=Disconformity*
32. **Unconformity from rock units A to C?** This unconformity is?  
*A=None, B=Nonconformity, C=Angular unconformity, D=Disconformity*
33. **Unconformity from rock units E to F?** This unconformity is?  
*A=None, B=Nonconformity, C=Angular unconformity, D=Disconformity*

**TRUE FALSE QUESTIONS: 2 points each; 10 points total :** These True and False questions deal with the order of events in the block diagram as for last questions. When determining the order note that it is not just the order of the rock units that is important. You must also be able to interpolate and interpret deformation events (e.g. folding, faulting), unconformities, etc if they occurred between the formation of specific rock units.

34. T/F. Unit C follows directly formation of Unit B?
35. T/F. Unit A is the oldest unit in the history.
36. T/F. Rock units C, D, and E are followed directly by rock unit H.
37. T/F. Rock C intrudes into rock B.
38. T/F. The folding of C, D, and E occurred before Fault Z.

### MULTIPLE CHOICE QUESTION: 8 points for right choice; 4, 2, 1 points for each less correct choice:

39. For the same block diagram as the previous questions, determine which sequence of events is the correct one.
- A Fault Z  $\Rightarrow$  H  $\Rightarrow$  Fault X  $\Rightarrow$  F  $\Rightarrow$  G
- B Fault Z  $\Rightarrow$  H  $\Rightarrow$  F  $\Rightarrow$  G  $\Rightarrow$  Fault X
- C H  $\Rightarrow$  Fault Z  $\Rightarrow$  Fault X  $\Rightarrow$  F  $\Rightarrow$  G
- D G  $\Rightarrow$  Fault Z  $\Rightarrow$  H  $\Rightarrow$  Fault X  $\Rightarrow$  F
- E F  $\Rightarrow$  G  $\Rightarrow$  Fault X  $\Rightarrow$  H  $\Rightarrow$  Fault Z

## PLATE TECTONIC THEORY

### WRITES MINUS WRONGS MULTIPLE CHOICE QUESTION: 3 point each; 21 points total:

At the back is a cross section labeled Plate Tectonic Theory. Below is a list of 15 features which could be found on that cross section. For the questions below Identify the *one* most appropriate name which corresponds to the lettered features on the cross section.

<i>Names to choose from to identify features on cross section (This same list is with the illustration at the back)</i>		
1A - Backarc basin 1B - Collision orogeny 1C - Convergent plate boundary 1D - Cordilleran orogeny 1E - Craton	2A - Divergent continental margin 2B - Divergent plate boundary 2C - Foreland 2D - Hinterland 2E - Island arc orogeny	3A - Melange 3B - Remnant ocean basin 3C - Rift plate boundary 3D - Suture zone 3E - Transform boundary

**Feature A** on the cross section is identified by which one of the terms.

40. 1A, 1B, 1C, 1D, 1E  
 41. 2A, 2B, 2C, 2D, 2E  
 42. 3A, 3B, 3C, 3D, 3E

**Feature F** on the cross section is identified by which one of the terms.

43. 1A, 1B, 1C, 1D, 1E  
 44. 2A, 2B, 2C, 2D, 2E  
 45. 3A, 3B, 3C, 3D, 3E

**Feature D** on the cross section is identified by which one of the terms.

46. 1A, 1B, 1C, 1D, 1E  
 47. 2A, 2B, 2C, 2D, 2E  
 48. 3A, 3B, 3C, 3D, 3E

**Feature B** on the cross section is identified by which one of the terms.

49. 1A, 1B, 1C, 1D, 1E  
 50. 2A, 2B, 2C, 2D, 2E  
 51. 3A, 3B, 3C, 3D, 3E

**Feature I** on the cross section is identified by which one of the terms.

52. 1A, 1B, 1C, 1D, 1E  
 53. 2A, 2B, 2C, 2D, 2E  
 54. 3A, 3B, 3C, 3D, 3E

**Feature H** on the cross section is identified by which one of the terms.

55. 1A, 1B, 1C, 1D, 1E  
 56. 2A, 2B, 2C, 2D, 2E  
 57. 3A, 3B, 3C, 3D, 3E

**Feature G** on the cross section is identified by which one of the terms.

- |     |     |     |     |     |    |
|-----|-----|-----|-----|-----|----|
| 58. | 1A, | 1B, | 1C, | 1D, | 1E |
| 59. | 2A, | 2B, | 2C, | 2D, | 2E |
| 60. | 3A, | 3B, | 3C, | 3D, | 3E |

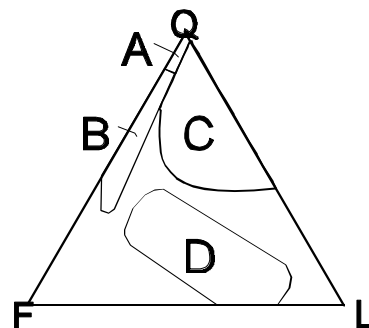
**TRUE/FALSE QUESTIONS: 2 points each; 4 points total.** On the same cross section as for the previous questions are three locations labeled “Plate.” True or false, they are in fact plates.

61. T/F. “Plate A” is in fact a plate.  
62. T/F. “Plate C” is in fact a plate.

## THE WILSON CYCLE

**QUESTION 11: TRUE OR FALSE: 2 POINTS EACH, 32 POINTS TOTAL:.** At the back of the test is a copy of the **WILSON CYCLE**. The questions below are concerned with the rocks and structures developed at various stages of the cycle.

63. T/F. Stage II - Igneous rocks generated here would be both mafic and felsic in composition.  
64. T/F. Stage II - sediments from this stage would be found primarily in field B of the QFL diagram.  
65. T/F. Stage II - the structures (faults) developed during this stage are principally the result of tension caused by uplift due to heat.  
66. T/F. Stage IV - is exhibiting tectonic activity.  
67. T/F. Stage V - the volcanic arc is made principally of hot spot volcanoes with mafic lavas and diorite batholiths.  
68. T/F. Stage V - sediments derived from the volcanic arc typically have more than 50% quartz.  
69. T/F. Blueschist is being actively generated in Stages V, VII, VIII.  
70. T/F. Stage VI - left side; the faulting of the rocks on the foreland, below the “N” arrow, are principally ramp and flat thrust faults.  
71. T/F. Stage VII - the right side is an island arc orogeny.  
72. T/F. Stage VIII - the sediments in the foreland basin of VIII would be more quartz rich than would be the sediments in the foreland basin of Stage VI.  
73. T/F. Stage VII - the marginal basin most likely is receiving feldspar rich sediments.  
74. T/F. Stage VIII - this orogeny is characterized principally by shear stress.  
75. T/F. No Stage is likely to exhibit a shield volcano.  
76. T/F. No stage is likely to exhibit a fissure volcano.  
77. T/F. No stage has a hot spot derived shield volcano.  
78. T/F. The primary evidence we have for believing the earth began with an ultramafic parent rock is that some original parts of the earth are still preserved and can be studied.



**RIGHTS MINUS WRONGS MULTIPLE CHOICE QUESTIONS: 3 points each, 24 points**

**total:** On the Wilson cycle are locations identified by a series of letters "A" through "R". For each of the location letters below identify the **ONE** rock type out of the 15 choices most likely to form at that location, selected from the table below.

Set One	Set Two	Set Three
1A - Amphibolite	2A - Felsic igneous	3A - Mafic igneous
1B - Arkosic sediments	2B - Granulite	3B - Quartz sediments
1C - Blueschist [melange]	2C - Greenschist	3C - Schist/Gneiss
1D - Carbonates	2D - Intermediate igneous	3D - Slate/Phyllite
1E - Eclogite	2E - Lithic sediments	3E - Ultramafic igneous

**Location A:** choose the one rock type most likely to form or be found at this location.

79. 1A, 1B, 1C, 1D, 1E  
 80. 2A, 2B, 2C, 2D, 2E  
 81. 3A, 3B, 3C, 3D, 3E

**Location C:** choose the one rock type most likely to form or be found at this location.

82. 1A, 1B, 1C, 1D, 1E  
 83. 2A, 2B, 2C, 2D, 2E  
 84. 3A, 3B, 3C, 3D, 3E

**Location F:** choose the one rock type most likely to form or be found at this location.

85. 1A, 1B, 1C, 1D, 1E  
 86. 2A, 2B, 2C, 2D, 2E  
 87. 3A, 3B, 3C, 3D, 3E

**Location G:** choose the one rock type most likely to form or be found at this location.

88. 1A, 1B, 1C, 1D, 1E  
 89. 2A, 2B, 2C, 2D, 2E  
 90. 3A, 3B, 3C, 3D, 3E

**Location J:** choose the one rock type most likely to form or be found at this location.

91. 1A, 1B, 1C, 1D, 1E  
 92. 2A, 2B, 2C, 2D, 2E  
 93. 3A, 3B, 3C, 3D, 3E

**Location P:** choose the one rock type most likely to form or be found at this location.

94. 1A, 1B, 1C, 1D, 1E  
 95. 2A, 2B, 2C, 2D, 2E  
 96. 3A, 3B, 3C, 3D, 3E

**Location Q:** choose the one rock type most likely to form or be found at this location.

97. 1A, 1B, 1C, 1D, 1E  
 98. 2A, 2B, 2C, 2D, 2E  
 99. 3A, 3B, 3C, 3D, 3E

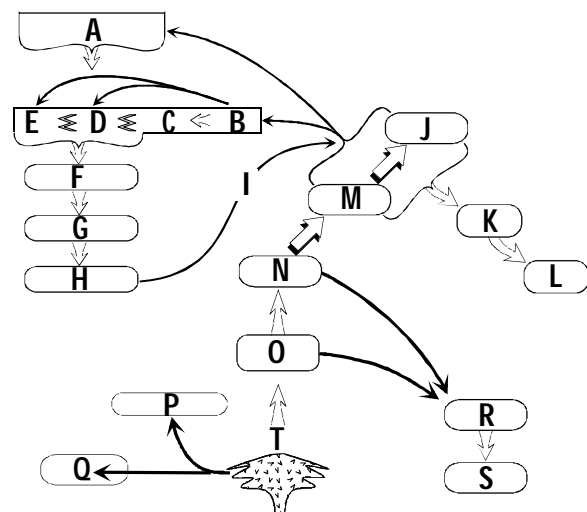
**Location R:** choose the one rock type most likely to form or be found at this location.

100. 1A, 1B, 1C, 1D, 1E  
 101. 2A, 2B, 2C, 2D, 2E  
 102. 3A, 3B, 3C, 3D, 3E

## PLATE TECTONIC ROCK CYCLE

**TRUE OR FALSE; 2points each; 10points total.** The next few questions relate the stages in the *WILSON CYCLE* (illustration at back) with the rocks generated in the *PLATE TECTONIC ROCK CYCLE*, illustration to the right.

103. T/F. **Stage I** - rocks B, C, D, and E are most likely generated in this stage.  
 104. T/F. **Stage V** (center) most likely generates rocks J, K, L, M, and N.  
 105. T/F. **Stage VII (right side)** - rocks F, G, and H will be generated in this stage.  
 106. T/F. **Stage VII (left side)** - rock C will be prominent in this stage.  
 107. T/F. Rocks T, Q, and P will be generated in **Stage III** but not **Stage V**.



## THE EVOLUTION BETWEEN LIFE AND EARTH:

### THE GAIA HYPOTHESIS

**TRUE OR FALSE; 2points each; 10 points total.**

108. T/F. The early water supply of Venus and Mars was probably lost by the photo disassociation of H<sub>2</sub>O by ultraviolet radiation and the subsequent loss of the hydrogen to space.  
 109. T/F. Life is a fractionating evolutionary attractor because it begins simple and evolves to ever increasing complexity.  
 110. T/F. The evolution of life is directed toward a point attractor.  
 111. T/F. Eukaryotes are essentially composed of prokaryotes living together.  
 112. T/F. Teleology is a belief that the phenomena of organic life can be fully explained only by the action of design and purpose.

**RIGHTS MINUS WRONGS MULTIPLE CHOICE QUESTIONS: 3 points each, 15 points total:**

<p><b>A</b></p> $\text{H}_2\text{S} \rightarrow \text{H}_2 + \text{S}^0$ $\downarrow$ $\text{H}_2 + \text{CO}_2 \rightarrow \text{Sugar}$	<p><b>B</b></p> $\text{H}_2\text{O} \rightarrow \text{H}_2 + \text{O}_2$ $\downarrow$ $\text{H}_2 + \text{CO}_2 \rightarrow \text{Sugar}$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <math display="block">\text{CO}_2 + \text{H}^+ + \text{O}_2 \xrightleftharpoons[\text{night}]{\text{day}} \text{Sugar}</math> </div>	<p><b>C</b></p> $4\text{H}_2 + \text{CO}_2 \rightarrow 2\text{H}_2\text{O} + \text{CH}_4$	<p><b>E</b></p> $\text{H}_2 + \text{CO}_2 \rightarrow \text{Sugar}$ $\uparrow$ $\text{H}_2\text{O} \rightarrow \text{H}_2 + \text{O}_2$ $\downarrow$ $\text{BIF} \leftarrow \text{Fe}_2\text{CO}_3 + \text{O}_2$
		<p><b>D</b></p> $\text{SO}_4^{2-} + \text{H}_2 \rightarrow \text{H}_2\text{S} + \text{H}_2\text{O}$	

113. ***Desulfovibrios.*** The biochemical strategy used by these organisms are which from the table above?

A, B, C, D, E

114. ***Precursor Blue Green Algae.*** The biochemical strategy used by these organisms are which from the table above?

A, B, C, D, E

115. ***The generation of methane.*** The biochemical system generating methane is (from the table above).

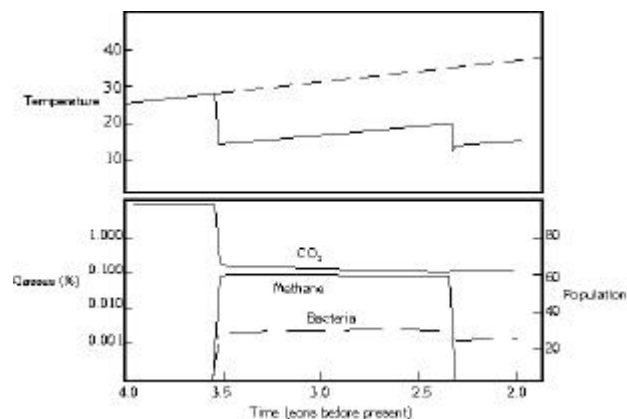
- A None of the choices in the table.  
 B Choice B  
 C Choice C  
 D Choice D  
 E Choice E

116. ***The generation of free oxygen in the atmosphere.*** The biochemical system accompanying the accumulation of oxygen into the atmosphere (from the table above).

A, B, C, D, E

117. ***White Daisies.*** The part of the graph to the right acting as the white daisies is.

- A CO<sub>2</sub>  
 B Methane  
 C Bacteria



**TRUE OR FALSE; 2points each; 6 points**

**total.** These questions refer to the diagrams to the right.

118. T/F. The rise of oxygen occurs because the methanogens decline in importance.
119. T/F. It is during this time that photosynthesizers first evolved.
120. T/F. Banded Iron Formation deposition does not occur with the appearance of abundant oxygen in this diagram.

